

Darlington Complementary Silicon Power Transistors

... designed for general-purpose amplifier and low frequency switching applications.

- High DC Current Gain — Min h_{FE} = 1000 @ I_C = 5 A, V_{CE} = 4 V
- Collector-Emitter Sustaining Voltage — @ 30 mA
 $V_{CEO(sus)}$ = 60 Vdc (Min) — TIP140, TIP145
 80 Vdc (Min) — TIP141, TIP146
 100 Vdc (Min) — TIP142, TIP147
- Monolithic Construction with Built-In Base-Emitter Shunt Resistor

MAXIMUM RATINGS

Rating	Symbol	TIP140 TIP145	TIP141 TIP146	TIP142 TIP147	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	100	Vdc
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}		5.0		Vdc
Collector Current — Continuous Peak (1)	I_C		10	15	Adc
Base Current — Continuous	I_B		0.5		Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$	P_D		125		Watts
Operating and Storage Junction Temperature Range	T_J, T_{stg}		–65 to +150		°C

THERMAL CHARACTERISTICS

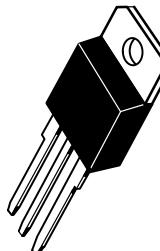
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.0	°C/W
Thermal Resistance, Case to Ambient	$R_{\theta JA}$	35.7	°C/W

(1) 5 ms, $\leq 10\%$ Duty Cycle.

NPN
TIP140
TIP141*
TIP142*
PNP
TIP145
TIP146*
TIP147*

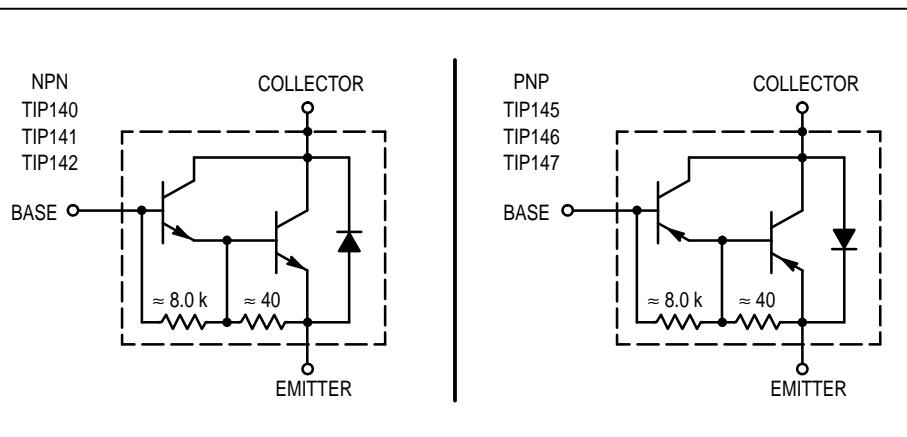
*Motorola Preferred Device

**10 AMPERE
DARLINGTON
COMPLEMENTARY SILICON
POWER TRANSISTORS
60–100 VOLTS
125 WATTS**



CASE 340D-01

DARLINGTON SCHEMATICS



Preferred devices are Motorola recommended choices for future use and best overall value.

TIP140 TIP141 TIP142 TIP145 TIP146 TIP147

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) ($I_C = 30 \text{ mA}$, $I_B = 0$) TIP140, TIP145 TIP141, TIP146 TIP142, TIP147	$V_{CEO(\text{sus})}$	60 80 100	— — —	— — —	Vdc
Collector Cutoff Current ($V_{CE} = 30 \text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40 \text{ Vdc}$, $I_B = 0$) ($V_{CE} = 50 \text{ Vdc}$, $I_B = 0$) TIP140, TIP145 TIP141, TIP146 TIP142, TIP147	I_{CEO}	— — —	— — —	2.0 2.0 2.0	mA
Collector Cutoff Current ($V_{CB} = 60 \text{ V}$, $I_E = 0$) ($V_{CB} = 80 \text{ V}$, $I_E = 0$) ($V_{CB} = 100 \text{ V}$, $I_E = 0$) TIP140, TIP145 TIP141, TIP146 TIP142, TIP147	I_{CBO}	— — —	— — —	1.0 1.0 1.0	mA
Emitter Cutoff Current ($V_{BE} = 5.0 \text{ V}$)	I_{EBO}	—	—	2.0	mA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 5.0 \text{ A}$, $V_{CE} = 4.0 \text{ V}$) ($I_C = 10 \text{ A}$, $V_{CE} = 4.0 \text{ V}$)	h_{FE}	1000 500	— —	— —	—
Collector-Emitter Saturation Voltage ($I_C = 5.0 \text{ A}$, $I_B = 10 \text{ mA}$) ($I_C = 10 \text{ A}$, $I_B = 40 \text{ mA}$)	$V_{CE(\text{sat})}$	— —	— —	2.0 3.0	Vdc
Base-Emitter Saturation Voltage ($I_C = 10 \text{ A}$, $I_B = 40 \text{ mA}$)	$V_{BE(\text{sat})}$	—	—	3.5	Vdc
Base-Emitter On Voltage ($I_C = 10 \text{ A}$, $V_{CE} = 4.0 \text{ Vdc}$)	$V_{BE(\text{on})}$	—	—	3.0	Vdc

SWITCHING CHARACTERISTICS

Resistive Load (See Figure 1)	t_d	—	0.15	—	μs
Delay Time	t_d	—	0.15	—	μs
Rise Time	t_r	—	0.55	—	μs
Storage Time	t_s	—	2.5	—	μs
Fall Time	t_f	—	2.5	—	μs

(1) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.

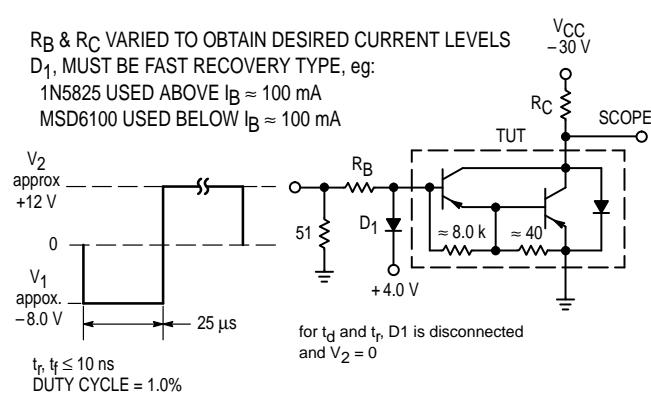


Figure 1. Switching Times Test Circuit

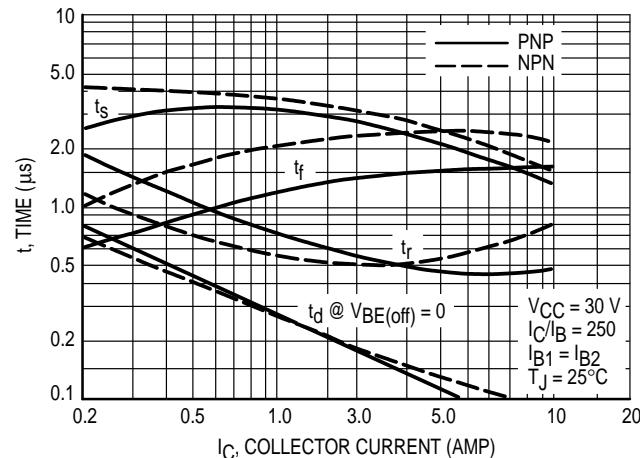
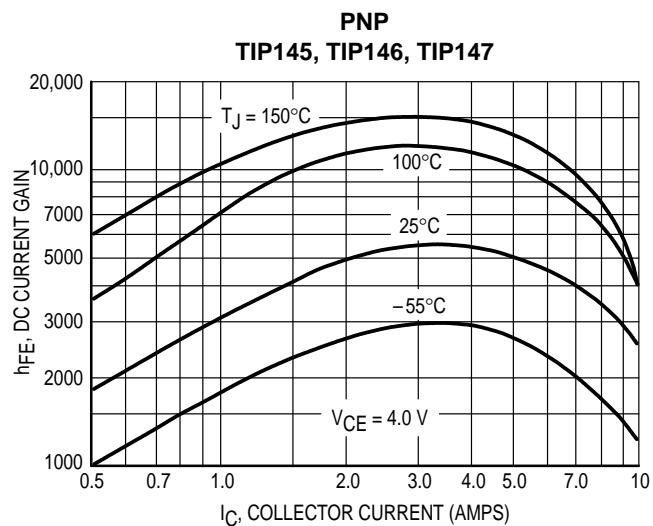
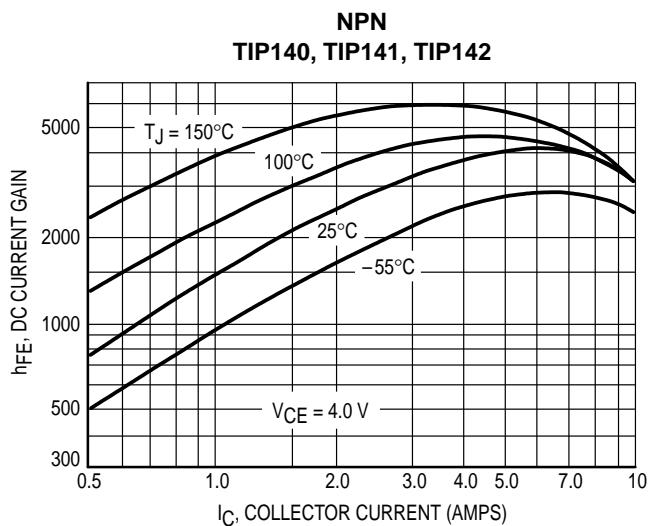
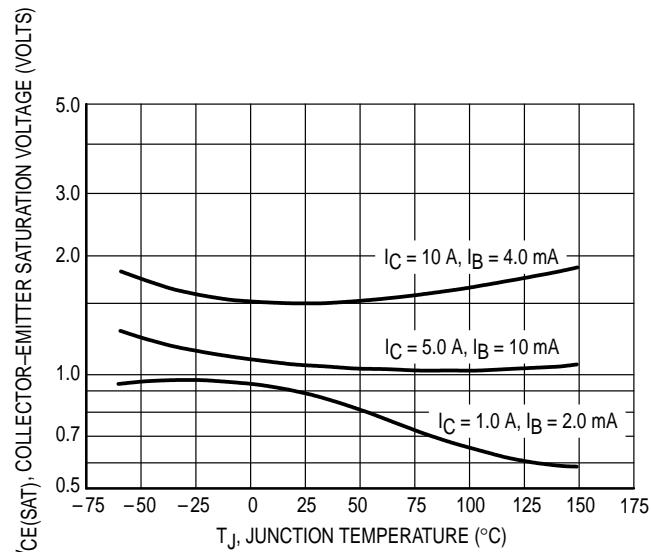
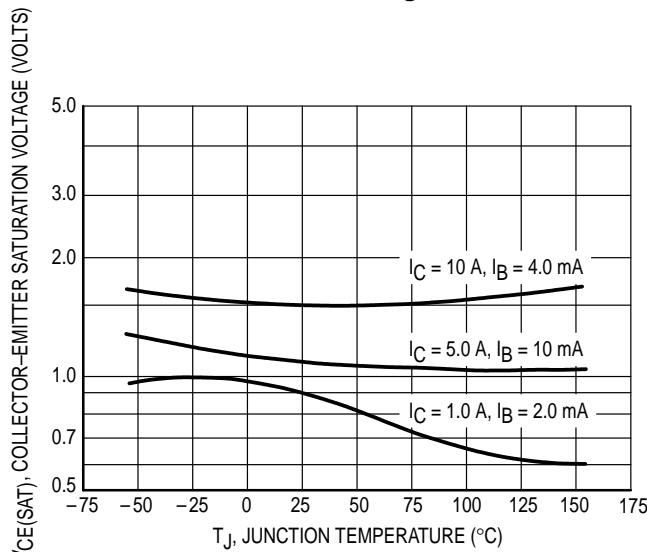
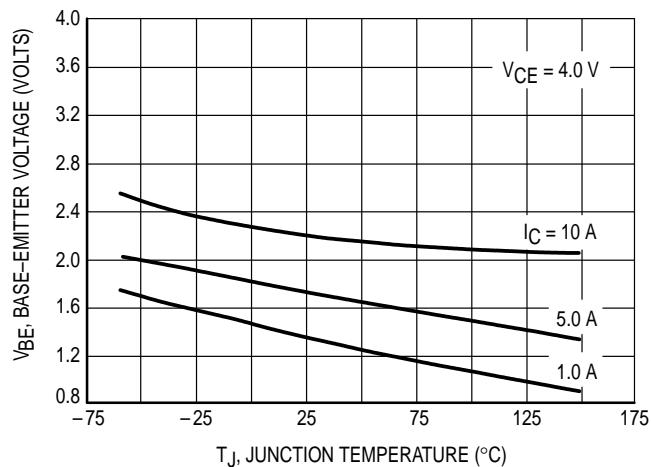
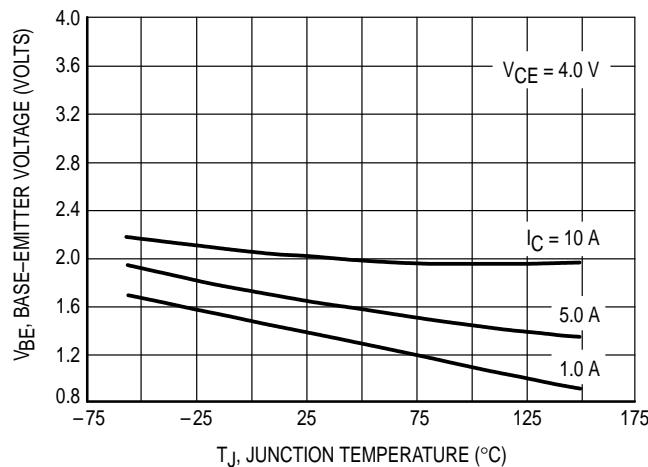
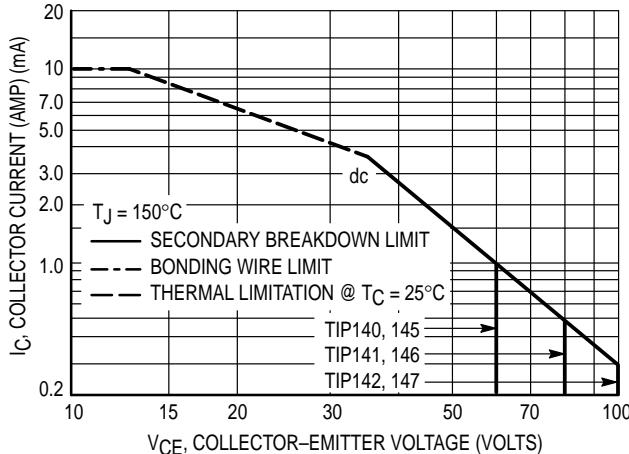


Figure 2. Switching Times

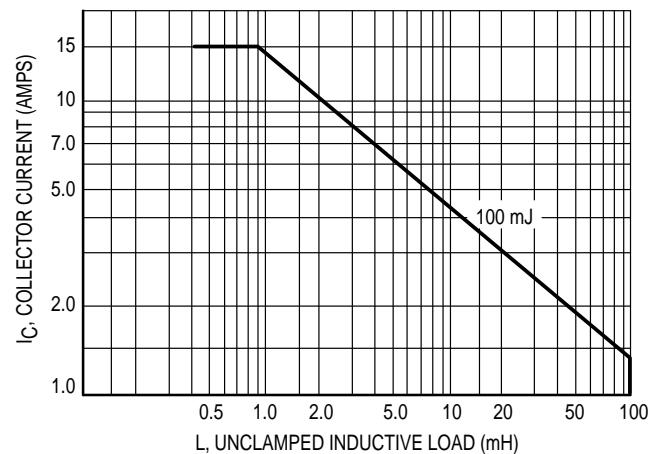
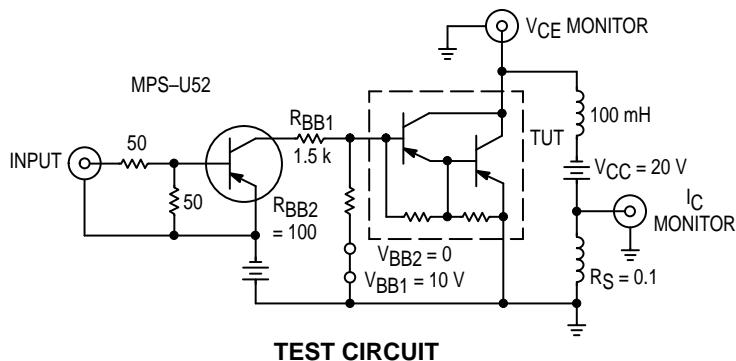
TYPICAL CHARACTERISTICS

Figure 3. DC Current Gain versus Collector Current

Figure 4. Collector-Emitter Saturation Voltage

Figure 5. Base-Emitter Voltage

ACTIVE-REGION SAFE OPERATING AREA

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C – V_{CE} limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

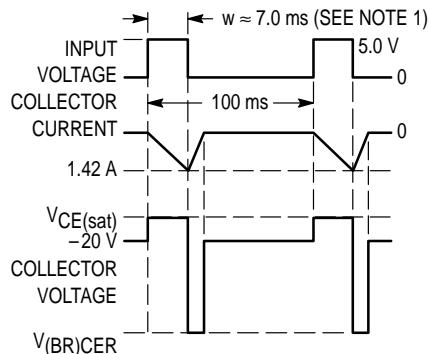
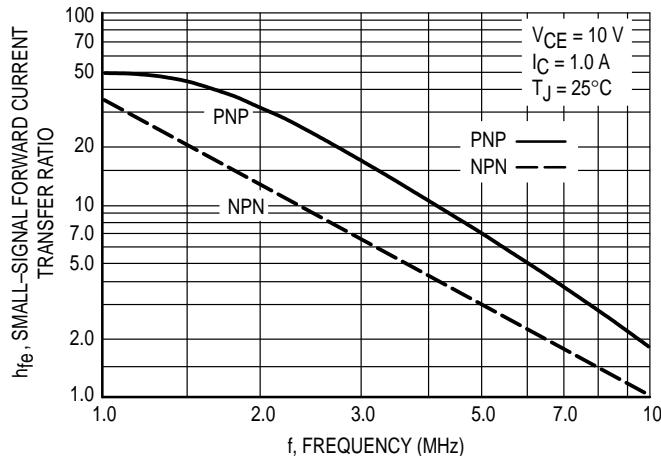
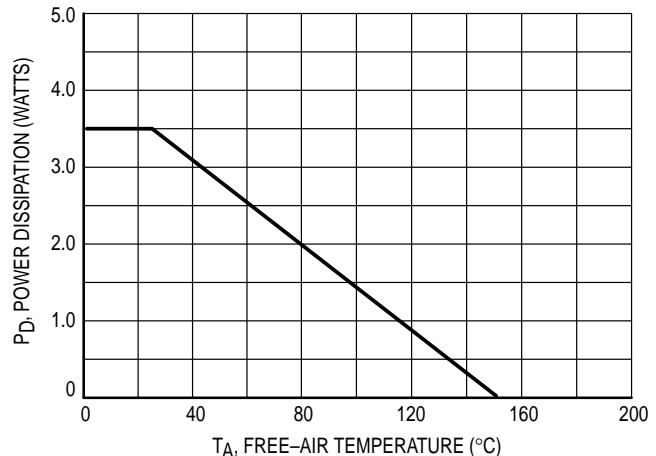

Figure 6. Active-Region Safe Operating Area

The data of Figure 6 is based on $T_J(pk) = 150^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

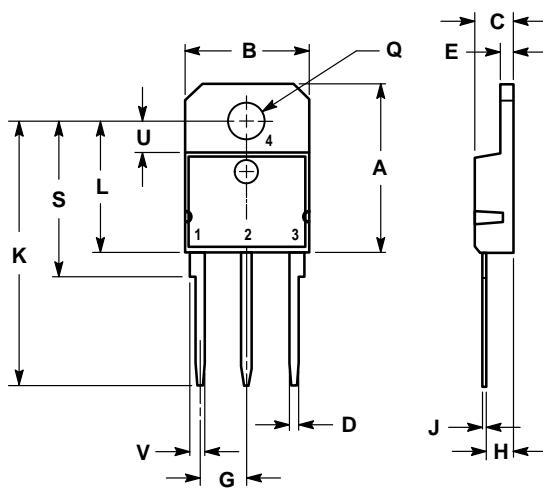

Figure 7. Unclamped Inductive Load

TEST CIRCUIT

NOTE 1: Input pulse width is increased until $I_{CM} = 1.42$ A.

NOTE 2: For NPN test circuit reverse polarities.


VOLTAGE AND CURRENT WAVEFORMS
Figure 8. Inductive Load

Figure 9. Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio

Figure 10. Free-Air Temperature Power Derating

PACKAGE DIMENSIONS



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.00	19.60	0.749	0.771
B	14.00	14.50	0.551	0.570
C	4.20	4.70	0.165	0.185
D	1.00	1.30	0.040	0.051
E	1.45	1.65	0.058	0.064
G	5.21	5.72	0.206	0.225
H	2.60	3.00	0.103	0.118
J	0.40	0.60	0.016	0.023
K	28.50	32.00	1.123	1.259
L	14.70	15.30	0.579	0.602
Q	4.00	4.25	0.158	0.167
S	17.50	18.10	0.689	0.712
U	3.40	3.80	0.134	0.149
V	1.50	2.00	0.060	0.078

STYLE 1:
 PIN 1. BASE
 2. COLLECTOR
 3. Emitter
 4. COLLECTOR

CASE 340D-01
 TO-218AC
 ISSUE A

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

MFAX: RMFAX0@email.sps.mot.com – **TOUCHTONE** (602) 244-6609
INTERNET: <http://Design-NET.com>

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



Copyright © Each Manufacturing Company.

All Datasheets cannot be modified without permission.

This datasheet has been download from :

www.AllDataSheet.com

100% Free DataSheet Search Site.

Free Download.

No Register.

Fast Search System.

www.AllDataSheet.com